RP 302 Rotor Hubs

The following recommended practice (RP) is subject to the disclaimer at the front of this manual. It is important that users read the disclaimer before considering adoption of any portion of this recommended practice.

This recommended practice was prepared by a committee of the AWEA Operations and Maintenance (O&M) Committee.

Committee Chairs:
Jim Sadlo, 3M
Gary Kanaby, Wind Energy Services
Principal Author: Jim Sadlo, 3M

Purpose and Scope

The scope of “Rotor Hubs” addresses proper purchase, transportation, maintenance, repairs, and balancing of wind turbine rotor hubs.

Introduction

The purpose of this document is to provide turbine manufacturers, owner/operators, and independent service providers in the wind energy industry with a description of the best maintenance, inspection, and repair practices for the rotor hubs employed on wind turbine rotors. These best practices are to serve as a guideline with the understanding that economics will drive the actual implementation decision at each individual wind farm.

1. Inspections

1.1. Areas of Inspection

Hubs need to be checked in detail and their condition is to be documented. Irregularities and damages are to be detected and a recommended repair date specified. The hubs need to be checked in detail by a reputable technical expert. Scope and type of inspection are taken from the following table. (*See Table A*)

1.1. Areas of Inspections
(continued)

Table A. Areas of Inspection.

Component to be Checked	Type of Inspection and Checkpoints	Minimum Inspection Frequency Every Year*
Hub	Visual for cracks, paintwork, corrosion	**Selected inspections may be needed after environmental incident events. Lightning storms, severe winds, hail, etc.*
Drive Shaft Slow Side	cracks, paintwork, corrosion, slipping clamping ring	
Bolted Joint Shaft – Hub	corrosion, crack, mounting torque	
Spindle	cracks, paintwork	
Rotor Bearing	noise, leakage, greasing, sump pan, lightning protection system, shaft nut	

1.2. Pre-Purchase Audit

In addition to the inspections listed above, documentation on the hub should include conformity to the manufacturer's engineering drawings.

1.3. Environmental Incident Inspection

Immediately following an environmental incident a ground based visual inspection for obvious hub damage should be conducted. Based on those observations additional inspections from the list above should be conducted.

1.4. On-going Inspections

Part of a consistent O&M recommended practice is to have a documented on-going inspection plan where all turbines are inspected on a regular basis. Extra inspections on problematic hubs are highly recommended as are higher inspection rates on previously repaired hubs.

1.5. Pre-End of Warranty Inspection

The key to the end-of-warranty inspection is to plan well ahead of the end -of-warranty in order to better plan out this inspection. Planning ahead is important because a single inspection may require a follow up inspection prior to bringing any warranty issue to the OEM before the warranty period is completed.

2. Transportation and Storage

2.1. Transportation

All hubs need to be shipped in compliance with the OEM transportation specification. Recommended practice would be to have this specification on-site prior to the shipping of the blades to ensure that all specifications are met, and in case any conflicting issues arise that deviate from this specification. Specific things to inspect are the bracing and support of the hub. Inspect for proper sealing and measures to ensure rust prevention during the transportation.

2.2. Storage

Storage of hubs needs to be different for the intended length of storage. Short periods of storage, such as staging for installation, can be varied as long as the blade is not exposed to undue mechanical strain or an environment that would compromise the exterior structure of the hub. Long term storage needs to address the following:

- Protection from UV light
- Metal surfaces from moisture
- Hub protected from rain, dust, and foreign objects, including small animals and insects from entering the interior of the hub
- Hub properly secured to the ground to prevent damage in high winds
- Hub properly supported and allow for the periodic rotation and lubrication of the bearings within the hub

3. Maintenance

As list in the table above, the inspections on the hub components should be part of the preventative maintenance schedule. The lubrication schedule should be based on the OEM recommendations.

4. Repair

All repairs where under warranty or past the warranty period should be conducted with OEM approved materials. The primary key to all repairs are to return the hub to the same physical strength, shape, and weight as it was commissioned.